RESPONSES TO ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE DRAFT RCRA FACILITY INVESTIGATION/REMEDIAL INVESTIGATION REPORT FOR OPERABLE 3

This document provides responses to formal comments from the Environmental Protection Agency (EPA) regarding the Draft RCRA Facility Investigation/Remedial Investigation Report for Operable Unit 3, Offsite Areas. Each comment received from EPA is presented below in **Bold** type followed by the corresponding response.

GENERAL COMMENTS

SECTION 1.0-INTRODUCTION

1. **The 1991 "remedy lands" investigation is not listed in Section 1.3.1 as one of the previous investigations conducted at OU3, even though the executive summary lists it as one of the primary previous investigations. Instead, Section 1.3.1 provides only a general discussion of the area called the remedy lands. To avoid reader confusion, this introductory section should fully describe the investigation conducted on the off-site RFETS acreage known as the remedy lands. A map of remedy lands sampling locations should also be included in this section.**

   Response: The 1991 Remedy Lands investigation has been referenced in Subsection 1.3.1 as one of the previous investigations performed at OU 3. A description of the Remedy Lands investigation has been included in Subsection 1.3.6.

SECTION 2.0-OU3 FIELD INVESTIGATIONS

2. **The summary of air sampling in Section 2.0 indicates that the three ultra high-volume air samplers were not installed until the summer of 1995. Therefore, no air data collected for this study are available for inclusion in this draft OU3 RFI/RI report. The lack of air sampling data is a glaring data gap, because other sections of the report state that air is one of the primary exposure pathways (p.2-39). The final report must provide the 1995 data that has been gathered by these samplers.**

   Response: As stated in the Draft RFI/RI report, approximately six months of the ultra high-volume air sampling data will be presented in the Final RFI/RI report (Section 4.7).

SECTION 4.0-NATURE AND EXTENT OF CONTAMINATION

3. **The nature and extent of contamination section of this report focuses on the chemicals of concern (COCs) selected for each medium. Although this limited focus on COCs is correct, the explanation and presentation in Section 4.0 is difficult to follow and understand. For example, page 4-1 only briefly describes the COC selection process. The actual COC selection process is explained in Section 6.1.2 on page 6-3, yet the reader is never referenced to this discussion. Instead, the text refers the reader to technical memorandum 4 for a discussion of the COC selection process. Also the text for each medium discussed concludes with statements regarding chemicals that were eliminated as COCs. These statements are**

confusing without a full explanation of the COC selection process. Specific examples of these concluding statements are listed below:

- **Page 4-40: "Uranium isotopes were not identified as COCs in surface soils for the human health risk assessment (HHRA)."**
- **Page 4-45: "Stream sediment analytes were evaluated by the COC selection process. The results of this evaluation indicated that there were no COCs requiring further evaluation for the HHRA in the stream sediments of OU3."**
- **Page 4-60: "The COC selection process eliminated all metals as COCs in subsurface soil sediments."**
- **Page 4-63: "Copper was eliminated in the COC selection process based on the concentration toxicity screen."**
- **Page 4-63: "Calcium and potassium were eliminated as COCs because they are essential nutrients, plutonium was eliminated because it falls below the PRG [preliminary remediation goal]."**

The introductory sections of Section 4.0 should be rewritten to include a general discussion of the COC selection process. The concluding statements for each medium can then be rewritten to clearly state why chemicals were eliminated as COCs. Statements in the last two bulleted items, such as "based on the concentration toxicity screen" or "because they were essential nutrients" are correct and should be retained in the report. An explanation of the COC selection process early in Section 4.0 of the report will help the general public understand a nature and extent of contamination discussion that is heavily focused on the limited COCs selected for OU3.

Response: A description of the COC selection process, including its objective and a discussion of the procedures involved in selecting COCs has been included in Section 4.0. Statements in the text concerning the elimination of COCs have been revised for consistency with the COC description.

4. **Several places in Section 4.0 also refer to potential chemicals of concern (PCOCs). This occurs on page 4-55 in the discussion of volatile organic compounds (VOCs) in Mower Reservoir sediment samples, and on page 4-63 in the discussion of Standley Lake sediment samples. PCOCs are also referenced during the ecological investigation summary. The report should explain the difference between PCOCs and COCs and also explain why PCOCs are described only for sediment samples and ecological samples.**

Response: For consistency purposes, the references to PCOCs for sediment samples in Section 4.0 have been removed from the text. PCOCs have been defined as they pertain to the Ecological Risk Assessment on page B-1 of Appendix B.

5. **In addition to focusing on COCs, the nature and extent of contamination discussion also focuses on the OU3 chemical concentrations that were elevated above background. For surface soil samples, a statistical comparison of the site concentration to the background concentration was conducted. For all other media, the site-specific concentrations were determined to be elevated or above background if "the OU3 mean concentration was greater than the upper-bound background value (i.e. mean plus two standard deviations) and the OU3 maximum concentration value was greater than the background maximum value." The results of the comparisons are then summarized in tables in the text. Rather than showing actual mean and maximum detections for OU3 and background, these tables are simply a listing of equations. That is, the tables contain columns that include the IHSS number, the analyte and the background comparison equation such as "<MEAN + 2SD, MAX." A listing of equations is meaningless to the general public. These tables should be recreated to include the name of the analyte detected, site-specific mean and maximum values, the background mean and maximum values, and a column indicating if the detection exceeds or is within background values based on the established criteria for determining if a concentration is elevated above background. This type of data presentation would allow the reader to clearly understand data comparisons in the text.**

Response: The statistical comparison tables have been revised to include the statistical values for each medium.

6. **The nature and extent of contamination discussion in Section 4.0 does not include any data, nor does it refer the reader to appendices containing a summary of the raw analytical data. Instead the reader is referred to Appendix E which contains three diskettes of data downloaded from the Rocky Flats Environmental Database (RFEDs) system. Therefore, the reader would have to know how to retrieve the information from the diskettes and then print out the data tables. This type of data presentation is not useable for the general public. Therefore, the public may conclude that no data are presented in the report. To accommodate the public's desire to view the data, data summary tables should be prepared and presented in the appendices.**

Response: During document development, discussions on data presentation were held with the agencies. Both agencies expressed their concern that the RI reports produced by RFETS have been unwieldy to review, and are intimidating to the public by virtue of their size. We agreed that OU 3 would be a more visible public document and it should be more user friendly. One approach was to reduce its volume by putting the data on diskette, and provide data summary tables as appendices. Appendix D provides these summaries. Printing out the data on the Appendix E diskettes would add approximately 1400 pages and 5 to 7 volumes to the document. Instructions for information retrieval are included in Appendix E.

7. **The data summaries for surface sediments (Section 4.5.1) include descriptions of the maximum values for radionuclides detected, including the sample number and location. Figures are referenced that contain sampling locations for only some of the maximum values noted in the text**

in this section. To maintain consistency, figures should be referenced for all maximum values discussed in the text.

Response: Figures have been referenced that show sampling locations for all maximum values referenced in the text. In addition, the figures will be revised to include the maximum values for each sampling location.

8. **Because resuspension of particulates and recent precipitation events are closely related, a summary of recent precipitation events or surface soil moisture content should be presented in the RI report for each wind tunnel test conducted.**

Response: Only one wind tunnel test was conducted within a few hours of a precipitation event and the results were not presented because of the unusually low emission rate for that location. All other tests were conducted at least 12 hours after a precipitation event. Soil moisture measurements were not taken because the soil moisture probe was inoperable, and because it measured moisture over a 6-inch interval. The wind tunnel tests could only be influenced by moisture content of the top 1-2 cm. Additionally, a tool to measure these conditions was not known to the investigators. Since the tests were done during the months of June and July, and these are not the high precipitation months, it can be reasonably assumed that the test conditions are representative of ambient conditions for the area.

SECTION 5.0-CONTAMINANT FATE AND TRANSPORT

9. **The primary purpose of the fate and transport section is to identify the primary transport mechanisms active at the site and the ultimate fate of contaminants. Although this section provides a great deal of information of radionuclide transport, it does not identify the primary transport mechanisms or sources of contaminants that have resulted in contamination of OU3. Instead, this fate and transport section appears to describe only the procedures used and results generated during a toxicological investigation of the site. A toxicological investigation, the evaluation of risk from site contaminants, does not address processes leading to contamination of the site. Without knowledge of these processes, it is not possible to determine the potential for additional contamination of OU3. Therefore, the fate and transport section should be revised to include a detailed examination of the sources and processes that have caused contamination observed at OU3. This section should correlate with the sources of OU3 contamination listed in the introductory sections of the RFI/RI report.**

Response: This section focuses on the primary transport mechanisms for OU 3 contaminants from an exposure perspective. The source, and how OU 3 came to be contaminated is discussed several times throughout the text. The thinking behind this section was to provide information to support the risk assessment by discussing transport mechanisms and exposure pathways. As a result, very little additional discussion of historical contaminant transport is included in this section. The text will be revised to distinguish between historical transport that resulted in the OU 3 contamination, and potential future transport that may result in exposure. The text will also be revised to include a discussion of source areas and contaminant transport processes.

10. **Although, the fate and transport section contains appropriate information concerning the transport of radionuclides, it is so poorly organized that it is confusing to read. For example, the effects of soil clay and organic carbon content on OU3 contaminant mobility are discussed in Section 5.3, the fate of contaminant section rather than in Section 5.2 the transport of contaminants section. Because this document will be read by the public, the presentation of the technical nature of fate and transport should be presented in a clear and logical format.**

Response: The information regarding the effects of clay and organic carbon on plutonium mobility is presented in Section 5.3 because this interaction ultimately effects the fate of the contaminant. It is due, in part, to this interaction that subsurface migration of this contaminant does not occur. It is agreed that while this interaction impacts how the contaminant is not transported, it may also impact the conditions under which transport occurs (e.g. attached to fluvially transported sediments). It is agreed that these effects can be talked about sooner in the text. The document will be so modified and reorganized.

11. **The discussion of the fate of OU3 contaminants is incomplete. This section should evaluate OU3 contaminants in regard to the site geology and the potential for contaminant mobility. This will allow for the identification of environments where contaminants may accumulate or be degraded. Presently, biouptake is the only fate process discussed in this section, but even this process is not discussed in terms of the identified OU3 COCs.**

Response: The text has been revised to provide more discussion regarding the fate of OU 3 contaminants. Biouptake is discussed in the Fate and Transport of Plutonium Subsection.

12. **The transport of OU3 contaminants by surface water is not adequately discussed. The majority of the text of this section pertains to planned OU3 surface water remedies, not to the transport of contaminants. Furthermore, the transport of radionuclides by surface water may be strongly influenced by storm events and this should be discussed.**

Response: Agreed. The text has been revised to discuss surface water transport more completely.

SECTION 6.0-SUMMARY OF BASELINE RISK ASSESSMENT

13. **The COC selection process generally follows the methodology developed by EPA Region 8 (EPA 1994). However, the text states that "if any one of the statistical tests performed for a given comparison indicated a significant difference between OU3 and background data, then the analyte was considered to be a PCOC and professional judgement was applied to determine if the statistical results were plausible." If it is determined by statistical analysis that site chemical concentrations differ significantly from background concentrations, the chemicals should be retained as COCs. Professional judgment should be applied only when deciding whether to include, not exclude, chemicals as COCs. Chemicals at concentrations significantly different from background levels should not be eliminated as COCs based on professional judgment.**

Additionally, calcium, iron, magnesium, potassium, and sodium were eliminated as COCs because they are considered essential nutrients, occur naturally in the environment, and are toxic only at very high doses. Before chemicals are eliminated based on essential nutrient status, chemical concentrations should be compared to recommended daily allowances (RDAs) or safe and adequate daily dietary intakes (SADDIs) (EPA 1994). If comparisons reveal that essential nutrients are present at concentrations that will result in intakes near RDAs and SADDIs under typical exposure conditions, they can be eliminated from the HHRA. It is not likely that any of the essential nutrients will be included as COCs but the comparison is necessary.

Response: On February 17, 1995, the Environmental Protection Agency, Colorado Department of Public Health, and Department of Energy approved the list of Chemicals of Concern (COCs) at Operable Unit 3 (see *Dispute Resolution Agreement by the IAG Project Coordinators, Operable Unit No. 3 Contaminants of Concern Technical Memorandum No. 4, February 10, 1995*). Chemicals, metals, and radionuclides were evaluated to arrive at the final list of COCs. Therefore, the methodology by which COCs were derived at OU 3 has been scrutinized and approved for use.

14. **The value used for the concentration term in several intake equations is listed in the table notes to be the average of the Rocky Flats Plant (RFP) and Colorado Department of Health (CDH) collection method. The text states that the 95 percent upper confidence limit (UCL) concentrations were used in the risk calculations. Therefore, the table notes are inconsistent with the text. If it is indicated that the average of the RFP and CDH collection methods was used to calculate the 95 UCL concentration, or that the average of the 95 UCL from both collection methods was used, the text and or tables should be modified so that they are consistent.**

Additionally, the 95 UCL should be used exclusively to estimate both reasonable maximum exposure (RME) and central tendency (CT) risks. According to EPA guidance (1992),

> **Because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent upper confidence limit (UCL) of the arithmetic mean should be used for this variable. The 95 percent UCL provides reasonable confidence that the true site average will not be underestimated.**

Response: Areas assessed within the human health risk assessment that had more than one sampling method result (U1A and U2A), used the 95% Upper Confidence Level (UCL) of the arithmetic mean concentration as prescribed by EPA guidance. Areas assessed within the human health risk assessment that had only one sampling method result (PT14192), used the actual sample result within the risk assessment. The Attachment 3 tables have been revised to present the above information.

15. **EPA is aware that DOE conducted an audit of the ecological sampling that was performed for this investigation, but we have not seen the results of**

the audit. DOE must make this report available so that all parties can have confidence in the data that was used to evaluate the ecological health risk in OU 3.

Response: DOE actually conducted two audits with regard to programmatic ecological sampling and analysis. These two audits were not specific to OU 3. The first audit was conducted in May 1994 by DOE, Rocky Flats Field Office (RFFO) personnel and their subcontractors (Formal Audit 94 QA-L1-004, "EG&G Rocky Flats, Environmental Restoration Management [ERM], Environmental Evaluations"). The second audit was conducted as a result of the first, due to the broad, generic conclusions drawn from the first audit and their corresponding implications. The second audit was conducted in November 1994 and lead by DOE staff from ORNL (Oak Ridge National Laboratory) and their subcontractors ("Data Quality Investigation, Rocky Flats Environmental Restoration Program, December 1994). Findings ("Issues") of the first audit referenced above were as follows:

I.1 "ERM has not implemented the Quality Assurance Program Description or revised the Quality Assurance Project Plan".

I.2 "ERM is out of compliance with RFI 5700.6 Criterion 4 (Documents and Records) and the EG&G RFP QA Manual Quality Requirements (QR-2A) Quality Assurance Program".

I.3 "ERM is out of compliance with the EG&G RFP QA Manual Quality Requirement (QR-7) Control of Purchased Items & Services".

In contrast, the ORNL team concluded that, notwithstanding the limited number of quality problems found in both the first and second audits, "...significant evidence gathered in this DQI suggests that these data can be used in limited ways for their original purposes." The ORNL report does not specify what those "limited ways" consist of.

Corrective actions resulting from the two audits focused primarily on formal completion and peer review of quality records containing environmental data, increased internal assessments on data management and reduction activities by subcontractors, and formalizing data quality assessments for overall data usability with respect to project decisions.

As a result of DOE concerns about ecological data, and consequently the Environmental Restoration program in its entirety, the ER Quality organization completed 94 internal assessements and 15 programmatic data quality indicator reports after 3 quarters in FY 95. The assessments corroborated existing quality as well as identified issues for correcitve action. Many corrective actions were implemented in real-time, at the time of the problem's discoveries, and documented within the assessment reports, while other, more pervasive problems were tracked and closed via the Plant Action Tracking System (PATS).

The most significant finding that was applicable to OU 3 was that field data forms were not authenticated or completed in accordance with procedure 2-G18-ER-ADM-17.01. Corrective actions include having the data collectors review and authenticate the original field data forms. This finding in no way affects the technical validity or useability of the data.

In addition to the audit reports and subsequent corrective actions discussed above, confidence in the data should also hinge on project performance based on the Data Quality Objectives (DQOs). The DQOs are discussed in Appendix B, Attachment 1.

The DOE audit report will be transmitted to the agencies under separate cover independant of the RFI/RI report.

16. **The text states that 100 millirads per day (mrad/d) represents an acceptable ecological exposure rate. This value is then carried through to a benchmark soil activity level of 4,000 picoCuries per gram (pCi/g) for plutonium. The reference cited in support of this discussion, however, is DOE (1995) and apparently was produced by Argonne National Laboratory. EPA had significant comments on the DOE document that have not been addressed. The use of an in-house document that has not been peer reviewed and substantiated by external researchers as a source of toxicity values does not meet the criteria established in technical memorandum 3 for ecological risk assessments. The development and rationale behind the use of 100 mrad/d should be explained in the ecological risk assessment itself. Changes in methods from those identified in DOE (1995) should also be identified. Where methods were not revised as requested in EPA comments, rationale and justification should be provided. This is especially true if the methods include the assumption that exposure will occur at 1 meter above the soil surface, which is a human health-based value and not an ecological value. Ecological receptors are likely to be exposed to contaminants at the ground surface where the concentration is unattenuated. The continued use of criteria that have not been approved by the regulatory partners in the interagency agreement should be explained and justified in detail.**

Response: The Argonne National Laboratory document, "Radiological Benchmarks for Wildlife at Rocky Flats Environmental Technology Site" is being finalized.

However, an explanation of the use of the 100 millirads per day benchmark will be included in the final version of this ecological risk assessment. This discussion will draw from published literature on which the Argonne National Laboratory document is based.

17. **The calculation that 4,000 pCi/g will provide a plutonium dose of 100 mrad/d does not match comparisons in Section 3.2.2, where 0.14 mrad/d correlates with plutonium activity of 0.026 pCi/g. The sources of the calculations should be defined and explained in the text of the risk assessment. The supporting calculations should also be provided.**

Response: The supporting calculations for the plutonium doses cited in Section 3.2.2 will be provided in an attachment to Appendix B. The sources of the calculation will be explained further.

18. **The text frequently states that 100 mrad/d represents an acceptable exposure benchmark for all ecological receptors. The aquatic PCOC discussion in attachment 5 of Appendix F uses 0.4 mgy/h, which is defined as equivalent to 1 rad per day or 1,000 mrad/d. The text and attachments should be reviewed, and the correct exposure benchmark used in both documents.**

Response: The acceptable exposure benchmark for a NOAEL dose to aquatic life is 0.4 mGy/h and was developed by the DOE-recommended dose limit (Blaycock, et. al., 1993). Yes, this is different than the 100 mrad/d dose for other ecological receptors. The text will be clarified to reflect this point.

19. **The aquatic life analyses continue to evaluate the ratio of Ephemeroptera/Plecoptera/Trichoptera (EPT) species to the total number of benthic macroinvertebrate species as an indication of the presence of pollution. The EPT measurement was developed as an indicator of organic pollution, especially that related to sewage treatment. Where metals are the contaminants of concern, the species that comprise the EPT component will change, but the overall ratio of EPT species to the total benthic macroinvertebrate community will not. The limitations of the analysis should be discussed in the document.**

Response: The limitations to the EPT analysis will be included in the final version of this ecological risk assessment.

20. **The future status of Great Western Reservoir is not clear. Currently the reservoir serves as the water supply for Broomfield, but this use will end in 1996. The disposition of the reservoir is not discussed, although contaminated sediments are acknowledged. The likely ecological effects resulting from abandonment, and possible drying, of the reservoir should be evaluated in the ecological risk assessment.**

Response: This is not an appropriate discussion for the RFI/RI report, but rather an issue that should be taken up with the City of Broomfield should they decide to abandon this reservoir.

APPENDIX G

21. **Appendix G, Summary of Quality Control (QC) and Quality Assurance (QA) concludes that the overall data quality objectives were satisfied for the OU3 samples. However, much of the evaluation needed to reach this conclusion is not presented in the appendix. Appendix G lacks the following essential elements:**

- **Evaluation of laboratory replicates**
- **Qualification of data associated with unacceptable relative percent differences (RPDs)**
- **Discussion of data comparability**
- **Discussion of accuracy**
- **Evaluation of radionuclide detections in blank samples**

In addition, Appendix G fails to clarify the following:

- **Source of acceptable standards for RPDs**
- **Whether all the QA/QC samples listed in the field sampling plan (FSP) were collected**
- **Whether nondetects were used to evaluate precision**

These problems should be corrected in the final version of Appendix G.

Response: QA and QC practiced within analytical and radiochemistry laboratories are verified through two (2) fundamental processes: a) pre-award quality audits performed on the laboratory of interest before a contract is let, and b) the data validation process, based on EPA guidelines, which includes 25% to 100% of any given data set related to a project. Results of the validation process are communicated in both hardcopy form, and in abbreviated form within the Rocky Flats Environmental Data System (RFEDS-- as validation codes: V=Valid, A=Acceptable with qualifications, and R=Rejected). The validation process would address several of the components listed here, including lab replicates, accuracies, and lab standards used for RPDs.

Data comparability - the OU 3 data is comparable within its own (OU 3) population, as well as comparable to other CERCLA or environmental data sets based on the use of standardized and documented operating procedures and methods in the field and in the laboratories.

Precision and Relative Percent Difference (RPD) values - acceptability and limitations of the RPD values are discussed on pp. G-9 through G-12, and the discussion qualifies the data as well as explains the data qualification process.

3.0 SPECIFIC COMMENTS

EXECUTIVE SUMMARY

1. **Page ES-4, Paragraph 2. The text states that "the 1991 Remedy Lands data set was included with the OU3 RI data set because the plutonium levels in the Remedy Lands samples are generally higher than most of the OU3 RI sample results. Combining the data sets results in a more conservative analysis. This data set followed EPA quality assurance requirements." On page ES-2, paragraph 5, the text mentions that 47 samples were collected in 1991 in the Remedy Lands, and references the Final Past Remedy Report, OU 3-IHSS 199 (DOE 1991b) for additional details on this study.**

   However, the Remedy Report (page 3, paragraph 2) states that "virtually all of the available data for IHSS 199 have been collected for the purpose of site characterization rather than risk assessment. While these data are well suited for site characterization, a detailed evaluation against EPA useability criteria indicates that existing IHSS 199 data do not meet current quality control standards to support a quantitative risk assessment." This OU3 RI report should explain why the remedy land data are now considered to meet the QC standards. More specifically, the OU3 RI report should define how the OU3 and remedy lands data sets were statistically evaluated and determined to be comparable for purposes of combining data sets.

   Response: The Remedy Lands 1991 data set was not included in the Final Past Remedy Report, Operable Unit No. 3 - IHSS 199 (DOE 1991b) as referenced in the Draft OU 3 RFI/RI report. The 1991 Remedy Lands data was presented in the "Jefferson County Remedy Lands Semi-Annual - Summer 1991 Report," dated August 1991. The text will be

changed to reference this document for a detailed discussion of the 1991 Remedy Lands data.

Attached as Appendix A of the "Jefferson County Remedy Lands Semi-Annual - Summer 1991 Report," the "Soil Sampling Plan for Jefferson County Remediation Lands 1990" document states that the soil sampling technique will follow the Colorado Department of Health protocol as outlined in the Rocky Flats ER Program Standard Operating Procedure No. 3.8. This is the same sampling method used to obtain the OU 3 RFI/RI soil data set, in addition to the Rocky Flats method, which followed EPA quality assurance/quality control protocol. As such, the 1991 Remedy Lands data set does meet the quality control standards to support a quantitative risk assessment.

2. Page ES-5, Paragraph 3. **The text states that "several of the RI sediment samples were collocated with the 1983/1984 sample locations to determine if the sampling and analysis methods and the results were comparable. These data sets were combined because it was determined that they were statistically comparable." The text of the RI report should summarize how these data sets were determined to be statistically comparable.**

Response: A discussion of statistical comparison between the 1983/1984 sediment data and the OU 3 RFI/RI data is included in Subsection 4.5.1 Surface Sediment. In this section, a reference is made to the statistical comparison memorandum presented in Appendix F (see Attachment 3), which provides a detailed discussion of the two statistical tests used for detecting differences between the data sets.

3. Page ES-9, Paragraph 1. **The text states "assessment of radiation dose compares these values with the DOE annual radiation dose limit for members of the public. The public dose is equal to 100 mrem/year for all routes of exposure." However, cleanup scenarios are now generally geared toward a total effective dose equivalent (TEDE) of 15 mrem/year for the maximally exposed individual. This is the limit that the Nuclear Regulatory Commission (NRC) has adopted in its draft "Radiological Criteria for Decommissioning." This may now be, or soon will be, in final form. EPA has signed a memorandum of understanding with NRC and is working with NRC to develop this rule. This rule is expected to be adopted for all radiological sites that the two agencies oversee. Furthermore, 15 mrem/year correlates to a risk value that is slightly greater than 1E-4, which means that 100 mrem/year is equivalent to a risk of nearly 1E-3, which is in excess of EPA's acceptable risk level for chemicals. In addition, slope factors that EPA uses for radiological risk are based on Biological Effects of Ionizing Radiation (BEIR) III results. The current guidance document on radiological risk is BEIR V, which is more restrictive on dose than is BEIR III. In the radiation dose assessment, the estimated TEDE should be compared to the EPA and NRC radiation dose limit of 15 mrem/year for members of the general public.**

Response: Radiation dose will be used as one criteria for assessing acceptable levels of radionuclides in the environment. The radiation dose criteria that will be used at OU 3 is being developed by EPA, CDPHE, and DOE as part of the Rocky Flats Cleanup Agreement. The primary driver for a radiation dose criteria will be the Environmental Protection Agency's preliminary proposed Radiation Site Cleanup Regulation.

SECTION 1.0-INTRODUCTION

4. **Page 1-23, Paragraph 2. This section summarizes previous and ongoing investigations at OU3. The text states that "the annual sitewide programs have provided 5 years of monitoring data sufficient in quality and quantity to meet DOE Order 5400.1 characterization requirements." The text should briefly explain DOE Order 5400.1 for clarification.**

Response: The following text has been added to briefly explain DOE Order 5400.1: DOE Order 5400.1, General Environmental Protection Program, specifies requirements for notification and reporting, environmental protection programs, and monitoring for assuring compliance with applicable Federal, State, and local environmental protection laws and regulations, Executive orders, and internal Department of Energy policies.

SECTION 2.0-OU3 FIELD INVESTIGATION

5. **Page 2-17, Paragraph 8. The text describes the surface water investigation and lists six drainages that were sampled at OU 3, including Church Ditch. Table 2-1 also lists six drainages from which surface water samples were collected. However, the table does not list Church Ditch as one of the drainages sampled, whereas Broomfield Ditch, is listed on the table, but is not included in the text. Three drainages Dry Creek Valley Ditch, Broomfield Ditch, and Coal Creek that Table 2-1 lists as having been sampled are not included on Figure 2-2. These discrepancies should be corrected, and other referenced tables and figures in the report should be checked against the text to resolve inconsistencies.**

Response: Surface water samples were not collected from Church Ditch. The reference to Church Ditch in the text has been deleted. A reference to Broomfield Diversion Ditch has been added to the text. The Dry Creek Valley Ditch, Broomfield Diversion Ditch, and Coal Creek sample locations will be included on a report figure.

6. **Page 2-23, Bullet 2. This bullet states that reservoir surface water samples were not collected during high and low reservoir capacity, as stated in the work plan. The bullet then states that based on historical reservoir data, differences were not observed. This statement should be expanded to list some of the actual historical chemical concentrations at high and low reservoir capacity. This information is necessary to support the conclusion that there is no difference in chemical concentrations during high or low capacity of the reservoir.**

Response: Historical surface water data is reported in the Monthly Environmental Monitoring Report. Since data is collected on a monthly basis for this report, it reflects seasonal variations that may impact the surface water quality. The values for plutonium in the surface water have traditionally been very low. The RFI/RI report has been revised to reference the Monthly Environmental Monitoring Report as a source for historical data, and example values for 1991 are included in the reference.

7. **Page 2-40, Table 2-5. The relationship between the wind tunnel wind velocity and the equivalent 10-meter wind velocity appears to be inconsistent with the relationship presented on Page 5-8, Paragraph 2. In**

this paragraph, the third sentence states, "the diluting wind speed, u, is 12.01 [meter per second] m/s, which is the 1-meter equivalent of 18.6 m/s reduced from 10 meters." The wind velocities stated in Table 2-5 should be rechecked and, if necessary, should be corrected.

Response: The wind velocities stated in Table 2-5 were checked for accuracy and found to be correct. The data presented in Table 2-5 is the raw data used to derive equation (5-3) presented above paragraph 2 on page 5-8. The one-meter equivalent wind speed is the mid-point of the mixing height (2 meters) that is used in the box model.

SECTION 3.0-PHYSICAL CHARACTERISTICS OF OU3

8. **Page 3-2, Paragraphs 2 and 3. Numerous discrepancies that should be corrected exist in the text, tables, and figures for projected population and household numbers.**

Response: The projected population and household number discrepancies in the text, tables, and figures have been corrected and updated.

9. **Page 3-23, Paragraph 1. The text describes the five drainage basins that are located within the OU3 study area and references Figure 3-8 for locations of all five basins. The figures contains only three of the five basins in addition to their boundaries inside RFETS. The remaining drainage basins should be added to the figure or if size limitations prevent this, another figure should be added to show the missing drainage basins.**

Response: The text and figures have been revised to present four major drainage basins inside the RFETS boundaries instead of five.

SECTION 4.0-NATURE AND EXTENT OF CONTAMINATION

10. **Page 4-45, Paragraph 1. The text lists the creeks and drainages that were sampled and analyzed during the sediment investigation. This list does not match Table 2-1 in Section 2.0 (Page 2-4), which summarizes all of the sampling performed for the OU3 RI. According to Table 2-1, Smart Ditch and the Broomfield Diversion Ditch were included in the sediment investigation. However, Paragraph 1 does not list them. Inconsistencies between different sections of the report should be corrected.**

Responses: The text and tables listing the creeks and drainages that were sampled for sediment analyses have been revised.

11. **Pages 4-61 and 4-62. Section 4.5.3 provides spatial analysis discussions of surface and subsurface sediment data. Throughout the section, figures and tables are referenced. However, some of these figures and tables do not exist, including Figures I-10 through I-12 and Figure 4-7, and Table 4-7. The missing figures and table should be added to Section 4.5 and Appendix I.**

Response: The text has been changed for consistency between the referenced figures and tables.

12. Page 4-63, Paragraph 2. **Section 4.5.5 provides a sediment summary for the surface and subsurface sampling investigation at IHSS 200 through 202. The text states that plutonium was found to be elevated in the subsurface sediments above background but was eliminated as a COC in the selection process. This statement may contradict statements in page 4-56, Section 4.5.2, Paragraph 6, which explains that plutonium-239, and plutonium-240 were retained as COCs in Great Western Reservoir in the subsurface sediments. Page 4-56, Paragraph 6, explains that, as part of the COC selection process, plutonium levels were compared with PRGs, and the PRG value (exposure for a construction worker) is significantly higher than the maximum values detected in any of the reservoir sediments. Finally, the text in Paragraph 6 explains that plutonium was still retained as a COC in Great Western Reservoir. This discrepancy between a summary section and other subsections of Section 4.5 should be corrected.**

Response: The text has been changed in Sections 4.5.2 and 4.5.5 to explain that plutonium was retained as a COC in Great Western Reservoir subsurface sediments, as a conservative measure, due to the uncertainty of the future use of Great Western Reservoir.

13. Page 4-63, Paragraph 3. **The text summarizes the surface and subsurface sediment investigation at IHSS 201. The text states that the COC selection process eliminated plutonium in the subsurface sediments as a COC, but it fails to explain the reason that it was eliminated. Paragraphs 2 and 4 summarize the surface and subsurface sediment investigation for IHSSs 200 and 202, respectively. These paragraphs include a reason for specific analytes being eliminated as a COC. For consistency, all three paragraphs should include a reason for eliminating analytes as COCs.**

Response: A discussion of the COC selection process steps which eliminated specific analytes as COCs has been incorporated into the sediment summary paragraphs.

14. Page 4-66, Paragraph 4. **The maximum activity for uranium-235 in a sample from monitoring well 49292 is identified as 0.083 pCi/L. However, Table D-4 presents the maximum activity for uranium-235 in a sample from monitoring well 49292 as 0.18 pCi/L (dissolved radionuclide analysis). The groundwater monitoring well data should be checked and inconsistency between text and tables resolved.**

Response: Table D-4 lists both dissolved (filtered) and total (unfiltered) analytical results for radionuclides in groundwater samples. The 0.18 pCi/l value referenced in the EPA comment is the maximum uranium-235 activity in a sample collected from well 49292 for dissolved radionuclide analysis. The 0.083 pCi/l value presented in the text is the maximum uranium-235 activity for total radionuclide analysis (see Table D-4).

The text has been changed to include maximum values identified for radionuclides in groundwater samples for total (unfiltered) and dissolved (filtered) analyses results. A reference has also been added to inform the reader that both total and dissolved analytical results for groundwater samples may be referenced in Appendix D (Table D-4).

15. **Page 4-69, Paragraph 6. Several monitored particulate concentrations are given in this paragraph. Most of the concentrations are given in milligrams per cubic meter (mg/m^3), which is incorrect. The correct units are micrograms per cubic meter ($\mu g/m^3$). The report should be corrected.**

Response: All particulate concentration units have been changed from mg/m^3 to ug/m^3 in this paragraph.

SECTION 5.0-CONTAMINANT FATE AND TRANSPORT

16. **Page 5-5, Paragraph 7. The third sentence states, "the respirable percentage of suspended contaminated soil particles with diameters less than 10 micrometers has been estimated to be approximately 20 to 40 percent." The source of this estimate is unclear. The sentence should be expanded to provide the scientific basis for estimating that 20 to 40 percent of suspended particulates is PM10.**

Response: The source for this estimate was not verified. This sentence has therefore been removed from the text.

17. **Page 5-8, Paragraph 4. The text presents the modeled particulate concentrations for each scenario, but it does not clearly explain how these concentrations were calculated. The report should describe more clearly how emission rates were incorporated into the model. Specifically, how many 15-minute wind speed values were used to determine the final concentration for each scenario? Also was an average emission rate assigned for each 24-hour period or for each 15-minute period? In addition, the data used to calculate these particulate concentrations should be presented so that the modeled concentrations can be verified.**

Response: The number of 15-minute wind speed values for each scenario varied depending on the year of meteorological data used. From 1990 to 1994, there were an average of 11 days per year where the wind speed was above the threshold velocity. For each of the 11 days, the highest 15-minute interval was used to calculate the dust resuspension for that day. The dust resuspension values calculated for each of the 11 days were then summed to obtain a total dust resuspension value for the year.

Additional discussion has been added to the report to describe more clearly how emission rates were incorporated into the box model.

18. **Page 5-9, Paragraph 5. The results of the fugitive dust modeling (Figures E-2 and E-3) should be presented in plutonium activities. In addition, the use of inhalation risks is confusing and does not aid the discussion of contaminant transport.**

Response: FDM modeling was performed in an effort to improve our ability to communicate risk. In addition to providing a Box Model to quantify exposure for the risk assessment, we attempted to show risk from resuspended particulates in a way that could be spatially correlated to locations on a map. In performing this modeling, we had to make numerous assumptions that were unrealistic, or not fully supported by the data in order to provide enough resuspended material to calculate a risk. In other words, under normal

conditions in OU 3, there is very little measurable resuspension occurring, and thus very sparse information to input into a model. As a result, presenting this information generated more questions than answers, and did not serve its intended purpose. At an earlier presentation of this information, the EPA suggested that it be removed from the RFI/RI report because of the reasons stated above. While we have sought to improve the presentation, it has become clear that it does not aid the discussion of contaminant transport and will be removed from the text. In attempting to perform this modeling, we have learned a great deal, which we have shared with the agencies in presentation. We may continue to use these presentations in other public forums to help with risk communication.

19. Page 5-10, Paragraph 4. **This discussion of plans to protect drinking water supplies is not relevant to the fate and transport of OU3 contaminants. It should be deleted.**

Response: The discussion of the Standley Lake Protection Project and Option B is included because it directly relates to the potential for future transport and exposure (one of the objectives of this section). In the section reorganization, it was moved to the discussion on contaminant fate because these water management practices will directly affect the ultimate fate of future contaminant movement.

20. Page 5-18, Paragraph 4. **This paragraph discusses how complexation can increase the solubility of an element. However, it does not describe whether complexation reactions will increase the mobility of plutonium and americium, which are the two COCs at OU3. This information should be added to this paragraph.**

Response: Site-specific complexation reaction data that may be used to describe interactions between soil/water and radionuclides were not available. The effect of complexation reactions on the mobility of radionuclides is considered as part of the effect of adsorption, as discussed in Subsection 5.3.3 and 5.3.4. It is expected that complexation reactions would have an insignificant effect on mobility of plutonium and americium at OU 3 due to their extremely low solubility and very strong adsorption potential. This discussion has been added to the Complexation Reactions paragraph.

21. Page 5-18, Paragraph 6. **Surface waters may transport radionuclides sorbed to suspended material; therefore, surface water should be a medium of concern.**

Response: Text has been revised to include this transport mechanism.

APPENDIX A - HUMAN HEALTH RISK ASSESSMENT

22. Pages A-45 through A-52. **According to these tables, aluminum, cobalt, lithium, and lead were eliminated because no toxicity values were available. This is incorrect. Provisional Reference Doses have been developed by EPA's Technical Support Center for aluminum (1.0E+00), cobalt (6.0E-02), and lithium (2.0E-02). Region 3's Risk Based Concentration Tables can be used as the reference. There are also quantitative values available to screen lead in soil and potential drinking water sources. OSWER Directive #9355.4-12 sets forth 400 ppm as a screening level for lead in soil at CERCLA and RCRA sites. The national primary drinking water regulations**

for lead and copper specify 15 ppb as a level for requiring action for drinking water. These values should be used to screen for lead in soil/sediment and surface/groundwater.

Response: See response to General Comment No. 13.

23. **Page A-74, Table 6-1. Why is only one slope factor provided for both inhalation and external exposure? EPA's HEAST tables show separate and different slope factors for inhalation exposure vs. external exposure. These both need to be shown separately in the table.**

Response: Separate slope factors for inhalation exposure and external exposure will be presented in Table 6-1.

24. **Tables A7-7 and A7-8. The age adjusted ingestion rate is incorrect for the assumptions listed in these tables. The correct value should be 114 mg-yr/kg-day as is shown on page 23 of EPA's Human Health Evaluation Manual: Part B (OSWER Directive 9285.7-01B).**

Response: Tables A7-7 and A7-8 have been revised to include the 114 mg-yr/kg-day value for the age adjusted ingestion rate.

25. **Page A-92, Section A8.3. The linearized multistage model used by EPA to extrapolate carcinogenic risk is a conservative model, however, it is not "the most conservative model" as stated in this section. There are a number of distribution and mechanistic models which are more conservative (Casarett and Doull's Toxicology). The text should be revised accordingly.**

Response: The sentence, "This is the most conservative model for evaluating radiation risk.", has been deleted from the text.

26. **Attachment 1, Table 3. A central tendency gamma shielding factor of 0.8 is listed for a future recreational user. How would a recreational user be shielded in an open space environment? If inadequate data or reasoning are available, a separate value for central tendency should not be chosen simply because a space exists for it in the table.**

Response: The Gamma Shielding Factor was part of the approved list of exposure parameters in letter 95-DOE-08453 on exposure parameters, S. Slaten to M. Hestmark and J. Schiefflin, dated June 15, 1995. This letter documented the decisions made in a joint working group that included the EPA, CDPHE, and the DOE.

Attachment 3, Risk Spreadsheets.

27. **Tables 5 through 8 and 23 through 26. The sample concentration (SC) should be included in the tables, because it is not possible to verify the calculation of the airborne radioactivity concentration (ARC). Furthermore, documentation for calculating the ARC term should be provided. The use of the dust concentration from surface soil (DC) and activity in dust/activity in soil (R) parameters is unclear. If these parameters are being used as a basis for estimating dust load, the reasoning should be clearly justified in the text.**

The assumptions for inhalation exposure are correctly listed in Table 2 of Attachment 1 (Exposure Parameters). However, in Tables 5 through 8 and 23 through 26 of the spreadsheets in Attachment 3, a different set of assumptions are used for inhalation. It is assumed that the inhalation risk summarized in this risk assessment document are based on the incorrect assumptions used in the spreadsheets. Table 2, Attachment 1, lists a respirable fraction of 0.46 and 0.36 for RME and CT exposures, respectively. No particulate deposition fraction is used. In Attachment C (SHOULD BE ATTACHMENT 3), however, a respirable fraction of 1 and a respiratory deposition factor of 0.85 is used. The spreadsheet and risk assessment results should be revised using the correct assumptions in Attachment A (SHOULD BE ATTACHMENT 1), Table 2.

Response: The sample concentration (SC) values for each of the three exposure areas (PT14192, U1A, and U2A) are presented in Table 1 of Attachment 3. The dust concentration from surface soil (DC) was derived by the box model. The dust/activity in soil parameter (R) represents the ratio of radionuclide activity measured in the wind tunnel samples to the radionuclide activity measured in the collocated soil samples.

The airborne radioactivity concentration (ARC) equation [ARC = SC x DC x CF x R] is used to convert from airborne dust concentration to airborne plutonium concentration. A discussion regarding the derivation of the ARC values for the exposure areas, including definitions of the equation parameters, has been incorporated into Subsection 5.2.1.

The basis for the use of the Respiratory Deposition Factor (RDF) was reviewed. Since the PM10 fraction was also used in the inhalation equation, the RDF will not be used further. The inhalation risks and doses will be recalculated without the RDF. The assumptions used in Tables 5 through 8 and Tables 23 through 26 are correct since the box model results were reported in PM10 concentrations. The following statement has been added to Note No. (6) of Table 2 in Attachment 1, "These values were not used in the risk assessment and were changed to a value of 1.0 since the modeling results were reported in PM10 concentrations."

28. <u>Tables 9, 10, 27, and 28.</u> **The intake equations for residential exposure to external radiation from contaminated soil and sediment includes an exposure frequency ratio (EFR) parameter. The use of this factor is not consistent with the Rocky Flats Risk Assessment Template or EPA guidance (1991b). It may cause the estimated intakes of COCs to be significantly underestimated and should not be used.**

Response: The Exposure Frequency Ratio was part of the approved list of exposure parameters in letter 95-DOE-08453 on exposure parameters, S. Slaten to M. Hestmark and J. Schiefflin, dated June 15, 1995. The EFR was calculated by dividing the exposure frequency for each scenario for soil/dust exposure by days per year. The ratio was used to allow the equation units to balance.

29. <u>Tables 13, 14, 31, and 32.</u> **The intake equation for residential exposure through ingestion of vegetables includes several parameters that are not consistent with the risk assessment template. The use of deposition rate (DR), time to harvest (T), surface area (SA), and weight of produce (WT) was not justified in the document. The use of these parameters may**

significantly underestimate intake and, unless their use can be justified, they should not be used to calculate risk resulting from ingestion of vegetables.

In addition, the washoff factor (WF) should not be used. This factor is intended to represent the amount of particulate matter that is washed off of homegrown produce before it is consumed. Although this factor was used only to estimate CT risks, it was based on incorrect information. This value was proposed with the understanding that it had been used at the Rocky Mountain Arsenal. In fact, this parameter was not used, and EPA has previously requested that it be omitted from the equation. The WF should not be used to assess exposure to radionuclides on homegrown vegetables.

Response: The use of the deposition rate (DR), time to harvest (T), surface area (SA), and weight of produce (WT) factors maximizes the intake of Chemicals of Concern. The use of these factors allows the deposition of COCs onto fruits and vegetables to be assessed. Therefore, both the uptake of COCs through the soil into fruits and vegetables as well as the deposition of COCs onto fruits and vegetables are assessed.

APPENDIX B - ECOLOGICAL RISK ASSESSMENT

30. **Page B-18. This is not an acceptable conceptual site model. Since this is an important part of problem formulation, an adequate model needs to be presented here to demonstrate that all potential sources, primary and secondary release mechanisms, exposure pathways, contaminated media and potentially exposed ecological receptors are addressed.**

Response: The sitewide conceptual model is presented in detail in the EPA-approved, Ecological Risk Assessment Methodology Technical Memorandum No. 2, Sitewide Conceptual Model document. This document was finalized in February 1995, and was intended to be used for all Operable Unit Ecological Risk Assessments. The text will be clarified to explain this point.

31. **Page B-25, Table B3-2. Dose should be expressed in units of mrad/d, not pCi/g, which is an expression of activity.**
Response: Table B3-2 will be corrected in the final version of this ecological risk assessment to accurately depict the proper units for receptor dose.

32. **Page B-26, last paragraph. 0.4 mgy/h is about 10 mgy/d. This is not consistent with the dose given in Table B3-3. Also, 1 rad/d = 1000 mrad/d, which again is not consistent with Table B3-3.**

Response: See response to General Comment No. 18.

33. **Page B-27 and B-30, Tables B3-3 and B3-4. These table entries should be in exponential notation, i.e., 2 x 10^2, not 2 x 102.**

Response: Comment incorporated.

34. Page B-28, section 3.2.2. **The suggested guidelines for interpreting HQs are not toxicologically correct.**
HQ > 50 is not equivalent to an LC50.
1.0 < HQ < 10 does not necessarily mean that the exposure is > NOAEL but < LOAEL
HQ > 10 does not necessarily indicate that the exposure is > LOAEL
All these relationships will vary with the shape of the dose-response curve, and that is a function of the specific chemical and the receptor. This section should either be revised or deleted.
Response: This section in Appendix B will be rewritten to accurately convey the use of Hazard Quotients.

35. Page B-29, second to last paragraph. **What is being discussed here--exposure point activity or exposure dose?**

Response: What is being discussed is the calculation of soil activity levels protective of wildlife, based on the protective dose level. The paragraph will be clarified.

36. Page B-31, second paragraph. **Replace "no risk" with "no excessive risk above background", or "no unacceptable risk". It is not correct to claim no risk when dealing with a carcinogen.**

Response: The text will be modified to state "no unacceptable risk."

Attachment 2

37. **Expand on and justify the elimination of elevated concentrations of metals in sediments from the list of PCOCs by use of "spatial analysis".**

Response: The text will be modified to improve discussion of the elimination of elevated concentrations of metals in sediments. The methodology for selecting PCOCs for RFETS is detailed in the Ecological Risk Assessment Methodology Technical Memorandum No. 3, Ecological Chemicals of Concern (ECOC) Screening Methodologies, Draft Final Rocky Flats Environmental Technology Site document, dated April 1995.

38. **Why were organics such as PAHs, PCBs, phthalate esters, and pesticides not included in the list of analytes, since they are known to be site-related and present upstream in Rocky Flats watersheds?**

Response: The elimination of organics, including PCBs is discussed in Appendix B, Subsection B1.3.3. As defined in Technical Memorandum No. 3, the PCOC screening process was used to eliminate compounds from the list of PCOCs. All organic compounds were eliminated from the list based on detection limits from abiotic and biotic environmental media.

Attachment 4

39. Section 4.3.4, last paragraph. **The authors' claim that the results of the sediment toxicity tests should be disregarded is not adequately supported. The statement that the results of the chemical analysis of Walnut Creek**

sediments are not different than those from the other creeks has little meaning considering the limited suite of organic analytes tested.

Response: This last paragraph will be rewritten to more accurately portrait the strength of the toxicity test results.

APPENDIX C - SUMMARY OF SAMPLES COLLECTED AND ANALYSES REQUESTED

40. **Table C-7. This table does not accurately and completely present groundwater sampling events for OU3. The two groundwater wells were sampled eight times; however, only two dates, January 28 and 29, 1993, are listed under the column titled date collected. In addition, well 49292 is listed five times, and well 49192 is listed only once. This table should be revised to list the concentrations detected in each well during each of the eight times the well was sampled.**

Response: Table C-7 has been updated to include groundwater sampling information for the January, April, May, June, July, August, September, and November 1993 sampling events.

APPENDIX G - SUMMARY OF QUALITY CONTROL AND QUALITY ASSURANCE

41. **Page G-8, paragraph 2: The text incorrectly states that all QA/QC samples were collected in accordance with the FSP. For example, performance evaluation samples were not collected as prescribed in the FSP. Appendix G should identify QA/QC samples that were not collected but were prescribed by the FSP.**

Response: Table G-5 has been revised to show planned and actual QA/QC samples for each media. Performance evaluation samples were not collected because there were enough laboratory QA/QC procedures in place to document the precision and accuracy of the analytical data.

42. **Page G-10, Paragraph 2. This paragraph states that precision is evaluated on the basis of field replicates and, therefore, the text will not summarize the evaluation of laboratory replicate precision data. This evaluation of field replicate sample precision concludes by stating "imprecision of the radionuclide data is not related to sampling, but to the inherent error of the measurement process." The exclusion of an evaluation of laboratory replicates to assess analytical precision prevents a determination of whether precision DQOs are acceptable. Analytical precision should be included in Appendix G to make this QA/QC summary comprehensive and to address those "inherent errors in the measurement process" that are affecting radionuclide results.**

Response: Precision and factors affecting the precision values, including field vs. laboratory, are now addressed in the text. It should be noted that, in general, RPD values

will be greater (and hence precision will be less) using field duplicates, due to the additional variation (heterogeneity) within field duplicates, vs. lab duplicates.

43. Page G-10, Paragraph 6 (last paragraph).: **Unacceptable RPDs between samples and field duplicate samples are evaluated for entire suites and media across the entire investigation. This approach may overlook systematic, chemical-specific analytical problems in the data if unacceptable RPDs are identified for only specific chemicals. The validation process qualifies data associated with unacceptable RPDs. A chemical-specific evaluation should be performed where precision criteria (RPDs) were not satisfied.**

Response: Rationale for such a summary of precision and RPD values is given in the last paragraph on page G-10. It is believed that the current discussion adequately covers reasons as to why RPDs sometimes exceed the precision goals, especially due to matrix effects and ratios computed near the detection limits. These reasons are applicable whether the values are for entire suites or for individual analytes. A chemical-specific trend analysis would entail a separate, independent analysis, and require another complete section within the report; perhaps a consensus opinion is warranted before such an effort is undertaken.

44. Page G-12, Paragraph 1.: **It is unclear whether nondetects were used to determine precision. The second sentence of this paragraph states that "precision is better when only detected replicate pairs are evaluated." This statement implies that poor precision occurred when there were detect and nondetect results between replicate pairs; however, the last paragraph of page G-10 states that detect and nondetect results would not be compared in calculating precision. The text should clarify whether as implied detects and nondetects were compared in precision calculations.**

Response: Nondetect values were not used to calculate precision values. Only positive detection values were used to determine precision values.

45. Page G-13, Paragraph 3: **As stated in this paragraph, accuracy was evaluated only for surface water. To confirm that DQOs were satisfied the accuracy of all analyte groups and media should be evaluated.**

Response: Accuracy of analytical data for all suites and matrices is covered under the contract between RFETS and off-site analytical laboratories, also known as the GRRASP (General Radiochemistry and Routine Analytical Services Protocol). Accuracies are based on calibrations, statistically derived detection limits, and validation of the data by independent data validators following EPA Guidelines and RFETS-internal protocols.

46. Page G-15, . **Appendix G provides only a brief discussion of what is meant by comparability and states that for the OU3 investigation, data comparability was achieved by following database input protocols. This OU3 evaluation of data comparability fails to mention that data were compiled from various investigations without being considered comparable. In particular, data for IHSSs 200 through 202 were previously determined not to meet QC standards needed to support a quantitative risk assessment (DOE 1991). The comparability of data between investigations should be**

further evaluated as to comparability of sampling method, handling, analysis, and QA/QC results from other sampling events included in this RI.

Response: The historical data for IHSSs 200 - 202 were initially questioned because there was not enough information available to determine QA/QC results, handling protocols, and sampling methodologies. However comparability was further evaluated by performing a paired t-test and a Wilcoxon signed rank test on each of the data sets. The protocol outlined in the OU 3 work plan allowed the historical data to be used if no significant statistical differences were found in the comparisons, or, if the values in the historical data set were higher than those of the OU 3 RI data set. Appendix F of the OU 3 RFI/RI report documents the results of the statistical comparisons of the data sets.

47. <u>Table G-5</u>. **It could not clearly be determined if QA/QC samples were collected as prescribed in the FSP. Table G-5 presents the types and numbers of field QC samples by groundwater, surface water, sediment, surface soil, and trench; however, in the FSP the frequency and types of field QC samples were identified by solids and liquids. Also, no total number of samples is provided in Appendix G to determine the frequency of QC sample collection. Table G-5 should be modified to clearly demonstrate whether QC samples were collected at prescribed frequencies for all media.**

Response: Table G-5 has been revised to show total number of samples, and frequencies prescribed in the field sampling plan.

48. <u>Table G-10</u>: **Radionuclide detections were common in field blank and rinsate samples. No analysis of or reason for these detections was provided in the text. The frequent presence of radionuclides in blank and rinsate samples should be addressed in the text.**

Response: The title used for Table G-10 is a misnomer with respect to the majority of radionuclides; most of the results shown for radionuclides are below contract-required detection limits, which, for practical purposes renders them *nondetects*, by definition. Note the qualifiers of "B" and "J" for most of the radionuclide results.

4.0 REFERENCES

U.S. Department of Energy. 1991. Final Historical Information Summary and Preliminary Health Risk Assessment, Operable Unit No. 3 - Sites 200-202, page ES-1. April, 1991.

U.S. Environmental Protection Agency (EPA). 1989a. Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A), Interim Final. EPA/540/1-89/002. December.

EPA. 1989b. Exposure Factors Handbook. EPA/600/8-89/043. May.

EPA. 1991a. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Memorandum from Timothy Fields, Jr., Acting Director Office of Emergency and Remedial Response, PB91-921314, OSWER Directive 9285.6-03. March 25.

EPA. 1991b. Human Health Evaluation Manual, Part B: Development of Risk-based Preliminary Remediation Goals. Office of Solid Waste and Emergency Response (OSWER) Directive 9285.7-01B. December 13.

EPA. 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. OSWER Directive 9285.7-081. May.

EPA. 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. November.

EPA. 1994. Rocky Flats Plant Final Human Health Risk Assessment Template. August 1.